38. $f(x) = \int_0^{x^2} \sin t \, dt \qquad [0, \sqrt{\pi}]$

$$f'(x) = \frac{f(\sqrt{\pi}) - f(0)}{\sqrt{\pi} - 0}$$

$$\sin x^2 \cdot 2x = \frac{\int_0^{\pi} \sin t dt - 0}{\sqrt{\pi}} = \frac{2}{\sqrt{\pi}}$$

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33. $\frac{dy}{dx} = (1 + \ln x)\, y \qquad y = 1 \quad x = 1$

$y = ?$

$\int \frac{dy}{y} = \int 1 + \ln x \, dx$

$\ln|y| = x + x\ln x - x + c$

$\ln|y| = x \ln x + c$

$y = e^{x \ln x} \cdot e^{c}$

$y = A e^{x \ln x}$

$1 = A e^{\ln 1} = A$

$y = e^{x \ln x} = e^{\ln x^x} = x^x$

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review 19 FTC

I $\int_a^b f(x)\,dx = F(b) - F(a)$

where $F(x) = \int f(x)\,dx$

II $\frac{d}{dx}\int_a^x f(t)\,dt = f(x)$

or $\frac{d}{dx}\int_a^{g(x)} f(t)\,dt = f(g(x))\,g'(x)$

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$$\frac{d}{dx}\int_0^{\sqrt{x}} \cos t \; dt =$$

$$\cos\sqrt{x} \cdot \frac{1}{2\sqrt{x}}$$

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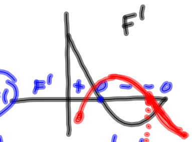
p 186 #3
or p187

let $F(x) = \int_0^x f(t)\,dt$ ...

A) F has max at ?

$y = f(x) = 0$ at $x=1$



$\boxed{F'(x) = f(x)}$

because F' changes from + to − at $x=1$

endpts ?

$x=0$ min at $x=0$
because $F'(0)$ pos.
so F is inc. at $x=0$

$x=3$ min at $x=3$
because F' is neg to the left of $x=3$
so F is dec

b) abs min at $x=3$
because area from $x=1$ to 3 greater than area from $x=0$ to 1

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